METHOD FOR AUTOMATICALLY AND INTELLIGENTLY SCROLLING HANDWRITTEN INPUT

TECHNICAL FIELD

The invention relates generally to computer systems, and more particularly to the input of data into a computer system.

BACKGROUND OF THE INVENTION

Small, mobile computing devices, including hand-held and palm-size computers and the like, are becoming important and popular user tools. In general, they are becoming small enough to be extremely convenient while consuming less and less battery power, and at the same time becoming capable of running more powerful applications.

Although such devices continue to shrink in size, size limitations are being reached as a result of human limitations. For example, a full character keyboard that enables user data input cannot be so small that human fingers cannot depress the individual keys thereon. As a result, such devices (e.g., palm-size computers) may eliminate the full size physical keyboard and provide a representation of a keyboard on a touch-sensitive display. To this end, the user enters characters by touching the screen with a stylus at locations corresponding to the displayed keys.

Alternatively, devices have been developed that allow the user to enter data written by hand directly on the screen. These devices receive pen movements as digital ink, and display the ink on the screen as it is input. The application may store the digitized ink as is, or the application may interpret some of the ink, e.g., it may attempt some form of character recognition, and then store the interpretation as ASCII text or the like.

Unlike conventional word processors that manually scroll upon receiving an enter key, or automatically scroll when the user has typed a character that will not fit on the currently displayed screen, when entering handwritten characters, there is no way to precisely know whether the user has finished writing on the last-displayed line or intends to add more to that line. For example, if the user is writing in the middle of the last line, it is not clear whether the user has ended one paragraph and wants to start a new paragraph, or whether the user is preparing to write additional characters on the same line. Similarly, it is not known when the user wants to keep writing in the same paragraph, but needs a new line to fit in the next word.

To avoid this problem, prior art inking mechanisms require the user to manually scroll the ink. However, manual scrolling is inconvenient and annoying to many users, slows down the input of information and tends to interrupt the user's thought processes as the user hunts for the scroll button.

SUMMARY OF THE INVENTION

Briefly, the present invention provides a method and system for automatically and intelligently scrolling handwritten input on a computer system. When the user reaches or passes a scroll point, typically the last displayed line for entering handwritten information, any pause by the user is timed. A pause is ordinarily defined by the user lifting the pen. The duration of the pause is compared against a threshold time, and once the threshold time is achieved, the system automatically scrolls for the user.

The threshold time may be variable, such as based on criteria including the last x-coordinate written before the pause, the amount that the screen is zoomed, the measured speed of the writer, or various combinations of these criteria. The amount to scroll may be similarly variable. Also, the automatic scroll may be effectively undone, such as by moving later-written ink up to eliminate any gap that likely resulted from the automatic scrolling operation, or by moving the scrolled ink back down, undoing the scroll.

Other advantages will become apparent from the following detailed description when taken in conjunction with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram representing a computer system into which the present invention may be incorporated;

FIG. **2** is a block diagram representing an underlying system architecture into which the present invention may be incorporated;

FIG. **3** represents a display on a touch-sensitive display screen on an exemplary computing device showing the receipt of written ink input;

FIGS. **4–5** represent a display on a touch-sensitive display screen on an exemplary computing device showing the written ink having reached a scroll point, and having been automatically scrolled, respectively, in accordance with an aspect of the present invention;

FIGS. **6–7** represent a display on a touch-sensitive display screen on an exemplary computing device showing new ink having been written after the scrolling operation represented in FIG. **5**, and the new ink moved up to the scrolled ink, respectively, in accordance with an aspect of the present invention;

FIG. **8** represents a display on a touch-sensitive display screen on an exemplary computing device showing the use of the horizontal position of the ink to determine an automatic scrolling time in accordance with another aspect of the present invention;

FIG. **9** represents a display on a touch-sensitive display screen on an exemplary computing device showing the receipt of written ink input while in a zoomed-in state relative to the zoom percentage of FIGS. **3–8**;

FIG. **10** represents a display on a touch-sensitive display screen on an exemplary computing device showing the use of the horizontal position of the ink to establish a threshold time while in the zoomed-in state of FIG. **8**;

FIG. **11** represents a display on a touch-sensitive display screen on an exemplary computing device showing the written ink of FIG. **9** having been automatically scrolled an amount based on the zoom percentage in accordance with an aspect of the present invention;

FIG. **12** is a flow diagram generally representing steps taken to determine when to automatically scroll in accordance with an aspect of the present invention; and

FIG. **13** is a flow diagram representing steps taken to determine when to move new ink up to scrolled ink in accordance with another aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Exemplary Operating Environment

FIG. **1** and the following discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented. Although not required, the invention will be described in the